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Structuring the IT Function: Case Study of Aalto University

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Tiivistelmä

Suuret organisaatiot, joiden on uudistettava sisäisen IT:nsä toimintaa, saattavat huomata olevansa vailla tarpeeksi hyvin tehtävän tukemiseen soveltuvaa tutkimustietoa. Tämän opinnäytetyön tarkoituksena tuottaa tätä tietoa tapaustutkimuksen ja kirjallisuuden avulla.

Opinnäytetyössä tutkitaan olemassa olevaa, sisäisen IT:n toimintaan liittyviä tutkimuksia, ja sitä rinnastetaan näytetyössä tehtävään tapaustutkimukseen Aalto Yliopiston organisaatiouudistuksesta. Aalto-yliopisto on tutkimuksen aikana uudistamassa perusteellisesti rakennettaan, mikä tarjoaa hyvän tilaisuuden tarkastella vanhanaikaisen ja hajanaisen IT-funktion, sekä uuden, moderneja malleja noudattavaan IT-funktion eroon.

Yliopiston henkilökunnan haastattelujen ja kirjallisuuden myötä viisi tärkeää IT-funktion tekijää erottuu joukosta tutkimuksessa: IT:n operatiivinen sijainti, IT-päätöstenteon sijainti, kytkennät IT-funktiossa, IT-ryhmien koko sekä henkilöstön fyysinen etäisyys. Opinnäytetyössä arvioidaan näiden tekijöiden vaikutusta sisäisen IT:n ja organisaation välisessä toiminnassa, ja havaintojen pohjalta tehdään johtopäätöksiä siitä, miten näitä tekijöitä tulisi säätää siten, että sisäinen IT toimii hyvin.

Avainsanat IT-funktio, keskittäminen, hajauttaminen, IT-hallinto

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Abstract of master's thesis

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Abstract

Large organizations that need to reorganize or develop their IT function may often find themselves in need of a sufficient informational material to assist in this task. This thesis takes a step towards providing this material, using a case study and the related literature.

This thesis explores the existing literature that features structuring of the IT function, and reflects it with a case study of IT function development at Aalto University. Aalto University is undergoing extensive reorganization, which provides an opportunity to examine the differences between an outdated IT function, and new one based on modern models.

By interviewing the faculty and with a review of the literature, five important IT function elements emerge from the study: locus of IT operations, locus of IT decision-making, connections in IT function, team sizes and personnel proximity. This thesis examines the effect of these elements on an organization, and how they should be adjusted in order for the IT function to work well.

Keywords IT structure, IT function, centralization, decentralization, IT governance

Preface

Thanks to Jari Collin for funding this thesis and providing advice

Thanks to Martti Mäntylä for the support and counseling

Thanks to everyone telling me that I should do my thesis for the thousandth time

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Martti Kostia

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1 Introduction

In 2015, Aalto University faced pressure to reorganize the way the information technology services were handled in the organization. Aalto University was a recently formed institution, that combined three existing universities into one. The new university needed to resolve what to do with the information systems that accompanied them. In at least one of the universities, the existing information systems were already quite splintered, which heavily emphasized the need for a comprehensive overhaul of the IT function. Questions regarding the arranging of the IT function were numerous: With the size of approximately 4000 employees and 12 000 students, the organization needed find out the best way assign meaningful positions for all the personnel working with IT. How would the sizable task of providing the information systems and services needed by the faculty and the students be divided? Which of the existing systems or services should be integrated into single, large entities, and which ones should remain as-is, under control of their local users? How should new information systems be acquired or implemented, and which part of the IT function will implement them? What would – in general – be the reasoning for these decisions, and who will get to make the decisions – now and in the future? To make matters more complicated, the original budget for Aalto University had been cut down by the government of Finland, and in order to meet new financial constraints, the university had to be mindful for finding cost savings.

During the transformation, the responsible managers – including the CIO – faced the task of reorganizing the IT function in a way that aligned it properly with the University. It needed not only to made sense as an IT function structure, but be cost-effective, and help improve the value that IT provided for the organization. This thesis is a look into this process, and attempts to create understanding in these mechanics behind the IT function and its interplay with its host organization. In this study, I go over literature that provides insight into the concept of structuring the IT function, and I interview the personnel at Aalto University; they have experience of the previous IT function, its evolution, and the new arrangements. This thesis will hopefully assist other enterprises in similar endeavors, when shaping an effective and cost-efficient IT function.

2 Research and case study

2.1 Research objective and research questions

The **research problem** in this thesis is that the existing literature does not provide enough convenient framework to assist in structuring the IT function, and it might not supply enough information regarding the issue in general. There is a plethora of parameters that need to be considered in shaping the IT function, but tackling these issues with existing body of knowledge is inconvenient, and does not seem to cover all of the questions a modern organization faces sufficiently. In particular, a lot of the literature seems to be relatively old, i.e. over 15 years of age, which is a particularly long time in the field of information technology.

The **research objective** is to break down the available information in literature, examine the case of Aalto University, and to reflect this information against the existing body of knowledge. In this thesis, I attempt to understand and collect the elements that affect the structuring of the IT function, and what is their relationship with the surrounding organization. I also attempt to aggregate and categorize them for convenient practical use. In essence, this thesis is a pursuit in sifting through a collection of observations regarding aspects that affect the performance of IT function, and sorting them in a manner that allows constructing components for the task of structuring an IT function.

The research questions of this thesis are:

1. What are the elements that the IT function is comprised of, organized in a readily understandable way
2. How should these elements be adjusted to make IT function well aligned with the organization

The research itself was conducted by interviewing Aalto University personnel. Nine interviews were held in total. The interviewees consisted of people that were connected to both IT and operations in departments, having experience in collaboration across units or with units and the central IT. Some amount of insight was also provided by several short, unrecorded discussions with the faculty.

2.2 Case of Aalto University

2.2.1 Overview

Aalto University is a befitting target for researching the structuring of IT in an organization. Not only is the university expected to reorganize many of its IT-related operations, the university, as an educational institution, is the emerging aggregate of three universities, relatively different in nature: the Helsinki University of Technology, Helsinki School of Economics and the University of Art and Design. In total, Aalto University is comprised of approximately 80 departments and units, and a transformation towards a unified organization has been under work ever since. Due to the extensive restructuring, Aalto University was open to large-scale changes and re-thinking it's IT function entirely. Observing this type of comprehensive transformation is a good opportunity for understanding how factors behind the IT function work: As the university changes itself from one type of structure to another, the personnel involved in restructuring will have a window to both the old structure and the new one. This allows the personnel to compare the two different structures and explicate their benefits and disadvantages and – in some cases – insightful viewpoints on why they work the way they do.

2.2.2 What is the IT function in Aalto?

The IT function in Aalto can be described as

a) the aggregate of personnel within the university, who specialize in utilizing information technology for the organization, and

b) the operations carried out by these personnel, and

c) to some conceptual extent, the information technology itself.

The IT function almost entirely *consists* of only IT related activities, but it does not *encompass* all of the IT ongoing activities in the organization. This is the case in a typical organization in the somewhat mundane sense that people might have personal laptops or mobile phones, use cloud services for listening to music and send messages with Skype, while the IT function might have nothing to do with these items or services. The question, however, what does the organization's IT really encompass, will be given consideration in more detail on a different context on this thesis. Nevertheless, IT function should be considered to be the heart of the IT activities of an organization, while not necessarily covering all of it.

2.2.3 IT centralization as the case study outset

As mentioned previously, the IT function Aalto University was in a transition during the study. Originally, the IT function was quite haphazardly splintered among the departments. The reason for this was that the university was quite "feudal" in nature, as may be typical for universities. The departments, divided by scientific discipline, i.e. electrical engineering, chemical engineering or computer sciences, were often quite autonomous. When the researchers and professors were working on projects, they would often get their work assignments and funding from outside the university. Because of this, the management did not have much to say in much their work. Also, when it came to teaching students, the faculty would largely mandate the actual details and content of courses, albeit the overall direction of what subjects were to be taught was directed from above in the hierarchy. All in all, the day to day operations of the universities was driven largely by the faculty themselves, and the management had more of a supportive function, rather than a directorial one. This made the organization strategically bottom-heavy, and the departments very autonomous. Because of this, no strong cooperation or coordination among the different departments had evolved in many cases, and the IT followed suit. Many departments had their own IT staff, who might have had some haphazard collaboration with other departments' IT personnel. The IT operations were the university were described as "anarchistic" by many interviewees.

The restructuring of the IT function had an overarching question, which functioned as a starting point: how much of the IT, that was somewhat erratically spread around the organization, should be consolidated. What activities, responsibilities and information systems should be moved to a central IT team, which would provide the service for the entire university, and what should be left for the departments, research teams, or decentralized IT personnel to handle. A centralized IT department was created for the university, named *Aalto IT*. The department, led by the CIO, was responsible for overseeing a migration of the proper pieces of the IT function to it. Negotiations were held between the university units and the center, aiming to reach consensus on the extent and the details of the implementation of the centralization. An interviewee pointed out how, around year 2005, departments did all IT-related tasks by themselves. At 2010, some of the services were provided together with Aalto IT, and at the writing of this thesis, most of the services came from Aalto IT.

This will be our starting point in the thesis: what should be centralized and what should be decentralized in IT; what is the general idea as described in literature, how does this reflect with the case study, and what new can we learn from the case.

2.2.4 Outlining the following chapters

The remainder of this thesis is divided in three parts: First, I will go over two factors that were observed to be elemental to the IT function: distribution of responsibilities and locus of decision-making. After this, I go over other three secondary factors: connections, team sizes, and personnel proximity; according to my evaluation, the effect of these is more auxiliary in nature, when compared to primary factors. As a general rule, for each factor, I will go over literature regarding the question first – where applicable – and then note and discuss the observations from case, and then present my conclusions on the matter.

3 Primary IT function elements

3.1 Overview

In this thesis, the concepts referred to as primary IT function elements are the two elements that were considered to be the most central in the IT function. They are a) locus of responsibilities and b) locus of decision-making. The intention is to divide the IT function into parts that are as *orthogonal* as possible in nature, in the sense that changing one element has little effect on others. This gives them modularity, which hopefully provides more value as parameters for morphing the IT function.

3.2 Locus of operations in the IT function

3.2.1 Overview

As mentioned in chapter 2, an integral question that Aalto University faced was the extent of centralization: how much of the work of the IT function should be done by the central IT department, Aalto IT, and how much of it should remain decentralized in the university departments. What should the responsibilities of centralized and decentralized units be, and what type of factors determine the level of centralization? First, I will take a look at the literature regarding the matter, in order to bring forth a better understanding of what, exactly, is being relocated during centralization and decentralization, and why.

3.2.2 Emergence of the centralization and decentralization problem

In the literature regarding the IT function and its relationships with their host organizations, there has been an ongoing discussion on the benefits and disadvantages of centralized and decentralized IT function models for decades. In fact, going over prevalent literature for IT function structuring elucidates that a large portion of the discourse in IT structuring has been about the *locus* of the IT function. At first, this was introduced as simply the question of where the computing power and the hardware of the enterprises should remain. Kahai et al (2003) and Olson & Chervany (1980) explain how in the 1960's, when corporations started adopting information technology on a significant scale, they first acquired individual large and expensive mainframe computers for the departments' use. In this way, the common corporate IT function was centralized, as the information technology of the time, i.e. computing power, was in one central location within the corporation. During the following years, "minicomputers" became available,

and the departments acquired them for distributed computing that provided for local processing needs, while the central mainframe remained as a data source. This was essentially the decentralization of the 1960's version of the IT function. Later in the 1980's, the IBM's microcomputers started replacing minicomputers, allowing the departments greater control over their IT activities without the centralized supervision, and new networking technologies allowed computers to become connected in local area networks. Strategic software applications could become centrally distributed to the whole organization. In general, the IT resources, activities and decision-making authority became more centered around the end user, and thus, relatively decentralized while having centralized elements.

In this manner, the way information systems were arranged depended somewhat on the nature of technology existing at the time. Information technology was originally utilized in simpler ways, i.e. only for calculating financial data. Since then, the role of information technology has evolved – instead of used simply for handling numbers, IT has become a strategic asset that enterprises use to gain advantage over competitors. During the following decades, as limitations started to subside with technological advancements, enterprises and the academic researchers attempted to understand the best way to organize the IT from more non-technical perspectives. Essentially, corporations started to shift between centralizing and decentralizing different aspects of the IT operations in order to find the best arrangements. The discussion incorporated responsibilities over a range of different IT activities and the authority to make overarching decisions. The alternation between centralization and decentralization remained for some time, and it was often referred as the "pendulum swing", as corporations kept on switching the way their IT was organized between one way and the other. (Simson 1990:158, Kahai et al 2003:53)

3.2.3 Dividing IT responsibilities by the type of IT

A modern organization generally seeks to structure its IT function in a manner that both centralizes and decentralizes its aspects in an optimal manner. This started to become a standard back in 1980's when corporations started utilizing "hybrid structures" or "federal models" that leave some aspects of the IT function to the center, while keeping some aspects of it centralized. Brown and Magill (1998:178) summarizes Ghoshal and Nohria (1993), Porter (1985), Bartlett and Ghoshal (1990), Govindarajan (1986) and Gupta (1987) by saying that if business units have individual decision-making designs

tailored for them, the costs of coordination and complexity will be higher, but the overall performance of the firms is better. Specifically, corporations noticed the benefit of keeping responsibility over the IT infrastructure at the center because it doing so gave advantages via economies of scale, operational efficiencies, synergies and standardization; the business application development and strategic use of IT to the was given to the departments, due to flexibility and quick responsiveness, and superior service (Zmud et al 1986, Simson 1990, Brown & Magill 1994). Also, **e**nforcing rules and maintaining common standards is easier, when done by a single central entity, rather than units acting independently of each other. Kahai et al (2002:48) observed how employees may purchase personal computers individually only to discover later that they have compatibility issues with company networks. Cross-platform compatibility in personal computers might not be as much of an issue in in the current day and age, but incompatibilities with varying information systems may still become an issue. If decentralized units establish information systems independently of each other, their systems might have a very poor level of compatibility within the organization. This could impede any establishment of organization-wide information systems for years to come.

The heterogeneity in the involvement of the central IT among different departments was certainly present in Aalto University. Some departments, or scientific "schools", had no particular need for custom IT solutions, such as School of Business and School of Arts, Design and Architecture, who were mostly relying on IT services of Aalto IT. The Department of Industrial Management in Aalto University was often satisfied with standard office software and off-the-shelf software, and not many people needed to delve into any complex information technology needs in this department. On the other hand, in some schools, the research and/or education was very IT-heavy in nature, and the departments were maintaining heavy autonomy in their IT operations to cover the high quantity of IT related needs, and the departments would employ multiple IT workers for managing their own IT to a great extent. Having heterogeneity and individually tailored IT function influence certainly made sense in Aalto.

The division between centralization and decentralization by the *type* of IT services was also clearly present in the university. The centralized IT department, Aalto IT, was in many cases responsible for arranging the IT infrastructure or services related to it to the university. As mentioned in previous section, centralizing the IT infrastructure had be-

come the common way for a corporation to organize the IT. If this was not the case in a department in Aalto, it was on its way to be. The standard office IT equipment, often referred to as "basic IT" by the interviewees, such as laptops and phones and software licenses were provided by the centralized IT, as well as services like email and systems for reserving meeting rooms. The web services aimed for students for administrative needs like course enrollments, or educational purposes like distributing course materials and assignments were also handled by the centralized IT. Before the university's web-sites for various university courses were undertaken by the Aalto IT, many departments based on scientific disciplines had their own custom-built websites for their own cours-es that each department was maintaining, but this practice was disappearing. Mean-while, the centralized IT was much coyer about getting involved with the IT that the researchers were using specifically for their research projects, i.e. special research-related software or particularly high computational capacity. This type of research IT mirrors the "business applications" that were mentioned previously, as the research would equate to "business". This type of is the type of IT was typically given as a re-sponsibility to decentralized IT because of the superior flexibility, responsiveness and level in service.

In the following sections, I will take a closer look at some of the reasoning behind this division of responsibilities, in order to understand the components that determine how should an organization distribute the IT responsibilities.

3.2.4 Cost-savings from centralization: economies of scale

Let's examine the benefits of centralization in more detail. First, there is the *economies of scale*: As written by Simson (1990:158), when information systems were first central-ized in the emergence of the early corporate IS, the attempt was to gain "cost-efficiencies and greater professionalism". Corporations had large mainframes and data centers in various, different sites, and combining them into one, large site brought cost-savings with economies of scale and scope (also Brown & Magill 1998:178). The soft-ware licenses that the individual sites required were a significant source of cost, and consolidating the data centers single site reduced the number of required licenses, and this reduced the IT expenses enough to make it the most significant reason for consoli-dation. Also, the hardware for data centers was purchased in bigger batches, which yielded discounts and benefits. Simson also notes, that the larger centers had superior

management and superior tools, and it is less expensive to implement these tools in one center rather than in multiple sites.

The IT personnel at Aalto mentioned often the benefit of consolidation with servers and data storages. Typically, when researchers needed a place to store data, servers or calculation capacity for the research purposes, a fairly typical approach was to simply go and purchase another server computer solely for the project. Because of this, the departments slowly accumulated a collection of server computers, and no one would have a comprehensive idea of what each one was for. The situation became much cheaper and more sensible when the centralized team started to acquire larger batches of servers for the use of many, rather than everyone buying their own hardware.

With centralized arrangements, another source of cost-savings comes from vendor management. If the central unit purchases appliances for multiple business units at once, better prices may be negotiated. Especially, companies find a lot of cost savings in licensing software for central IT infrastructure (e.g. server operating systems and database management systems) that can cater for the whole organization, rather than individual units licensing them separately. Similarly, the work required by purchases, i.e. vendor selection, can be done with smaller effort. Vendors can be negotiated with as a corporation, gaining advantage over business units negotiating with the vendors separately. Also, the corporation can share a database of their vendors and customers. Shared customer database allows the customers not to be contacted by multiple salespeople to inquire the same questions over and over, improving customer service. (Simson 1990:159)

The advantages of centralized vendor management were duly noted in Aalto – the convenience and cost-savings from having one point for vendor management and was often the first benefit of the central team that was mentioned in the interviews at Aalto. An incidence was revealed where one specific vendor was selling IT equipment for one department at Aalto for one price, while another department had been able to negotiate lower prices for the same items. The vendor was aware that they were selling items to the institution with two different prices, but it was not in the best interest of the vendors' sales personnel to let Aalto personnel know about this. Consolidating the purchase of standard IT equipment to the central IT not only gave leverage to the purchase, as they

were purchasing a bigger quantity of items, but it removed the need for multiple departments to find out proper vendors and prices individually – essentially doing the same task multiple times.

It was noted by one department IT manager, however, that ordering IT supplies via the centralized IT was seen as a decrease in convenience by some of the department faculty. In order to get equipment, a form had to be filled out and sent to the central IT, and then the item had to be retrieved from the central IT department, which was located on a separate building. For instance, if you needed a monitor, the instructions that you might ended up following was that you have to borrow university car to bring back the monitor to your desk from the separate building, unless you wanted to carry it for up to a kilometer, possibly in the rain. Previously, the faculty would just walk into the local department IT room, and either be handed the needed IT supplies directly, or they could retrieve it later, once it was ordered, or they would be delivered by the local IT personnel. This situation does reflect the notion that was given in the literature, where local IT gives superior and faster service, while centralization give cost-savings. This IT support and maintenance aspect of the university was still under development, and later on the IT support would be partially decentralized, so that you could still receive local assistance, but the decentralized was connected to the central IT to acquire centralization benefits. This would, for instance, ideally keep the logistics of IT at the responsibility of the IT personnel, and not hand it over to the non-IT faculty.

3.2.5 Centralization and decentralization: synergies and elimination of redundancies

When reading about advantages of having IT operations centralized, gaining cost-savings by finding redundancies and opportunities for synergies is often mentioned. Simson (1990:158) states that since centralized IT has an overview of the IT needs of the whole organization, it has the superior ability in integrating information systems, when compared to decentralized IT units. Also, as a centralized IT department has an overview of the flow information over the whole organization, it has a superior position to see beyond the bureaucracy and discover new business opportunities. Weill (2004:10) and Frey (2014:111) also note how central IT group often has a unique ability to find “opportunities for sharing and reuse” between business units, when using its view over the whole enterprise. Frey (2014:109) explains how in literature, one reason

why centralized IT arrangements are considered more oriented towards cost-efficiency, is due to the unnecessary multiplication of effort in disconnected, decentralized business units. For instance, the IT personnel in one unit might develop software or service for the needs of one unit, while another unit is developing or acquiring a very similar product simultaneously. Both units might be able to develop this software together as suitable for the needs of both units, but instead, they do it separately. Therefore, if the units are unaware of each other's actions, they may inadvertently be duplicating their efforts unnecessarily, performing redundant work. Weill & Ross (2004:69) give an example of this, as the central IT architecture team of Commonwealth Bank of Australia, while reviewing business application proposals, discovered that the business units were requesting customer service platforms with similar requirements, and managed to create savings of US $20 million using joint solutions instead (Weill & Ross 2004:69).

This type of objective of eliminating redundancy from the undertaken IT projects in Aalto was – in fact – one of the key driving forces behind the reorganization of the IT operations. The overarching task for the central IT department was negotiating with the business units i.e. scientific departments, what kind of information systems development endeavors should be centralized and what should not be centralized. Deciding to centralize generic activities such as IT infrastructural work was relatively straightforward, but when the question was about centralizing information systems development projects for services that were business-specific or acquiring business-specific hardware, the negotiating parties had to evaluate the subsequent steps more carefully. Eliminating redundancies and finding synergies is not always as simple as putting projects on a list, and then combining the similar ones and connecting the ones that are related. With generic IT issues that require generic IT solutions, this can often be sensible; the schools that found the basic IT services such as printers and course website platforms sufficient for their need, did not require local IT personnel, as these needs could be met by IT personnel who did not have special knowledge of the department's IT. However, when IT becomes more specific to needs to individual projects, handling the case can require more in-depth knowledge on the projects and their contexts themselves. Similar thing was noted by Frey in 2014, (p. 118) who stated that the relatively "low level of functional knowledge" centralized experts possessed was considered a hindrance. Writing specifications for information systems development in business units was considered inferior when done by centralized staff.

According to an interview in Aalto, there was a decentralized IT team that worked exclusively for two departments, and this team had become familiar with the research projects, and, in general, the *substance* of the departments, and could assist the department personnel particularly adeptly due to the local experience. As the team was working expressly on the business-specific IT issues closely with the departments, they would learn the business and the IT solutions that would work for it. When the local IT team became experienced with the work of the researchers and the specific IT solutions suitable for the business teams' purposes, the IT personnel had a befitting opportunity in finding new ways to eliminate the redundancies. Meanwhile, when the department personnel wished to discuss the IT regarding specific projects with the central IT, they were not able to be of significant assistance if they were not familiar with the arrangements involved. Gaining a high level of understanding with the business teams IT solutions would take time for an unfamiliar IT worker. Meanwhile the researchers would sometimes try to purchase IT equipment with project funds and try to set up the required IT by themselves, if waiting was not an option. The decentralized IT had the awareness and the experience in the local substance to set up the IT in a way that multiple projects could utilize it, creating potential cost-savings and synergy benefits. This conclusion from Aalto departments also accommodates observation of Brown & Magill (1994), who points out a centralized IT governance mode has more potential to exploit synergies if the business units are related, and if they are unrelated may benefit more from decentralized IT governance.

Now, to summarize the takeaway from this observation: the ability to find synergies in projects can be dependent on the IT experts understanding the business. The IT experts can understand the business if they act as a decentralized, local group among the business units, which indicates that decentralized groups can be better at finding synergies and cost-savings than a centralized unit, because the centralized unit does not have the local knowledge required for understanding the operations to the point of finding synergies. This scenario, however, requires that the IT is specific in nature, i.e. it requires work for the IT person to familiarize IT needs. If the IT needs are generic, then the centralized team might be of service as well as the local experts. In other words, we can use this to summarize a factor for deciding whether to decentralize or centralize IT: *how much decentralized department requires decentralized IT specialists, depends on how*

unique the department's IT needs are. For instance, IT infrastructure is typically relatively generic, which makes it suitable for centralization, as noted in the literature. Meanwhile, business applications and business-specific information systems can be more unique, depending how IT heavy the business is, and therefore more suitable for decentralized IT, as also noted in the literature.

3.2.6 Large and strategic projects

Frey (2014, p. 112,113) and Frey & Buxmann (2011) discuss that when compared to a decentralized setting, centralized unit is, in theory, generally better at initiating projects that are large, strategic or expensive. As mentioned before, literature generally ascertains that having centralized perspective on the enterprise projects makes considering the projects adjacently more convenient, as it supports discovery of interdependencies and redundancies. However, what it also does is that it allows the comparison and prioritization by value for the enterprise: centralized arrangements can assist in targeting the IT budget mostly for the most important projects. As centralized IT has a perspective over the whole enterprise while business units focus generally on their local issues and opportunities, which gives the centralized IT an advantage in finding and establishing the projects that are strategically relevant for the organization as a whole. Meanwhile, large and strategic projects "were often impeded" in decentralized arrangements. Business units may attempt to establish corporate projects by requesting participation in financing from other units, but they have to face the difficulty of convincing the other units of the benefits of the project. Negotiating the proportions of investment given by each unit can be difficult if the costs are spread throughout the organization in numerous yet small quantities. Centralized IT that would have to get financing from the units has the same issue, but with a budget for project initiation and promotion for the business units, the endeavor may work.

The Aalto case study did provide an insight to these views on both strategic, and large or expensive projects. First, it was not straightforward to say that the central IT at Aalto was better at initiating strategic projects. This was possibly due Aalto being strategically bottom-heavy organization. Aalto University is partially funded by the government of Finland, and partially by private businesses who finance research projects. Because of this, the University has a mix of goals from both up and down. The top down-elements of strategy stem from the requirements set by the government, as far as cost-efficiency and results go, to some extent. The government sets the overall guidelines for the uni-

versity's curriculum, and requires it to provide high quality education, while maintaining cost-efficiency and remaining within the budget. A top-down goal for the university is to be able to support the researchers, since they need provide the latest body of scientific knowledge for the university students via the courses, and they need to be effective in their research projects for the private businesses. The bottom-up direction comes from the fact that the research is guided and driven by the researchers. The researchers are most aware of the latest advances in their respective fields. Also, the research that is funded by private businesses is directed either by the researchers or by outside sources, and this acts as a source of revenue for the university. Therefore, the university must have mainly a supporting role for this research, thus creating elements of a bottom-up driven strategy to the overall strategy.

Now, the notion that centralized IT team has a better ability to select strategic projects does not apply particularly well for this structure in Aalto. To a significant extent, the strategic weight lies in the autonomous activities of the research personnel i.e. in departments. The central IT has a relatively coarse and high-level view on the departments use of IT in business, and in other words, the most strategic use of IT. The central IT cannot as effectively plan the most strategic IS development project, if the organization is so bottom-heavy, that the business of one department does not necessarily relate to the business of another department in any way. The central IT can more likely try to find some common and generic IT from departments in order to find redundancies or synergies. If the departments, however, are different, and the IT is different, then it is less likely for these synergies or redundancies be strategic. Conversely, if an organization would employ a top-to-bottom strategy, it would be easier for the central IT can align its choices according to the direction of business, which would be coming from the center. Although this is quite speculative, use this to construct a new parameter for the IT function structuring: *the ability of the central IT to select the most strategic projects can depend on how top-heavy the organization is.*

Also, a noteworthy point is that IT has become a significant strategic enabler for business (Venkatraman & Henderson, 1993), and if the local IT provides strategic advantages for a business unit, it might quite well excuse the higher cost of having a more expensive, decentralized IT. This generates a new parameter: *the strategic importance of a business unit affects the justification for higher costs of a local IT team.*

Second, we will look at the notion of central IT being superior with large or expensive projects. This was noted to be the case in Aalto; one example of a large project was a case where, as part of the effort to find cost-savings, one school had a goal of reducing the amount of classroom space needed. An approach to this was a project for utilizing "virtual space" for meetings and collaborations. This, however turned out to be much more sizeable project than what the IT personnel of the school could reasonably handle, and the issue was escalated further to the centralized IT. As this virtual space project would be beneficial to most university departments and units, Aalto IT started working on the project instead. In general, the departments' IT could quite well encounter needs among the departments researchers, that were simply too demanding in manpower, or in expenses that the local IT could not handle it. The interviewees also noted how difficult it was to get collaboration from different units to participate or invest in equivalent projects. The centralized Aalto IT had more experience in coordinating cross-department projects; and it was considered more convenient for them to gain the expertise in organization-wide project and investment management, rather than the departments attempting to do this case-by-case basis.

3.3 Decision-making and the IT function

3.3.1 Overview

In the previous part, I was assessing the distribution of responsibilities from the operational perspective. How would it make the best sense share the different IT related activities within the organization, so that it would have the best tradeoff between low cost and good service? In this chapter, we will be looking at the aspect of decision-making with the IT function.

3.3.2 Archetypes for decision-making

Between 1999 and 2003, Weill & Ross (2004) conducted a comprehensive study consisting of over three hundred enterprises for creating a taxonomy for typical IT governance arrangements in both public and private enterprises. Specifically, they focus on the positioning of two activities, the *decision-making* and the *input* for the decision making, and the relation of this to the structure of the IT governance. Unfortunately, the authors do not specify their definition of *input* in particular, but this thesis assumes the meaning to be the advice or opinions that help someone make a decision. This definition is also

in the spirit of how it is used in the Weill (2004). In essence, the questions here are: how to collect the information to make the best decisions for IT, and who should make the decisions.

The different positioning for the decision making and the input are categorized with six *archetypes.* The archetypes refer to the set of individuals who either give input or make the decisions, and who do the individuals collaborate with:

- The *feudal* archetype refers to the business units acting independently of the center. This describes the old structure of the Aalto University to a large extent.
- In *IT monarchy*, the executives in IT positions make decisions or provide input about the organization's IT on their own.
- In *business monarchy*, the decision-makers or the input providers consist primarily of non-IT business executives or CxO's. IT experts or IT executives may also be part of this group, but the premise is that the IT executives or IT experts do not act individually.
- The f*ederal archetype* refers to the CxO's acting together with business unit leaders (or process owners from business units). IT executives or IT managers from the business units may also partake in decision-making or providing input, but not necessarily.
- In *IT duopoly*, there is a predominantly IT-personnel group consisting of IT executives or business unit IT leaders, and they act together with one another group, which consists of either corporate CxO's or business unit leaders.
- In *anarchy,* individual groups act based on their own local needs, mostly disregarding any kind of cohesive organizational IS development.

Originally, Aalto University was quite close to the feudal archetype, considering how autonomously many of the departments acted. Some even described the old IT function of the university as an anarchy, as the IT personnel was somewhat arbitrarily scattered around the university with little overall direction, coordination or cooperation. Not a single person in the entire university, whom I discussed with during the study, seemed to think that this had been a good arrangement.

The new direction of the university was a somewhere between *IT monarchy* and *federal* archetypes. At the time of the study, the archetype of the university was an IT monarchy

in the sense that the decisions were made by IT personnel: the IT managers in the business units and the IT executives and IT managers in the center attempted to reach agreements together. The structuring of the IT function *was* being directed by the central IT, and they were given substantial power in the process – partially due to the need to find cost-savings in via centralization. The goal was always to maintain a balance between the central authority and the departments autonomy, and many non-IT managers and executives participated in the decision-making process. Because of this, the structure was also of the federal archetype in nature: everyone participated.

3.3.3 Archetypes and IT-related activities

In the Weill & Ross *IT Governance matrix* these archetypes are set against five different key decisions: *IT Principles, IT architecture, IT infrastructure, Business application needs*, and *IT investment and prioritization*. As shown in table 1, the study categorized which archetype was used for decisions and inputs for each key principle, with the poor performers and the top performers. The key decision of *IT principles* refers to "high level statements about how IT is used in the business" (Weill:2004, p.4).

	IT Decisions				
Input in archetypes	**IT Principles**	**IT Architecture**	**IT Infrastructure Strategies**	**Business Application Needs**	**IT Investment**
Business Monarchy					
IT Monarchy					
Feudal					
Federal	top			top	
Duopoly	poor			poor	
Anarchy					

Table 1: Performance of archetypes for collecting input for IT decisions (Weill & Ross 2004:131)

When providing input, the federal method was observed to be the best alternative with IT principles and business application needs, while duopoly was the worst. Essentially, this indicates that when collecting information from people for IT related decisions regarding business application needs and IT principles, what turned out to be the significant factor in how well this was perceived, was that *both* the corporate center and the business unit leaders were involved. If only either the business units or the center gives the input, the arrangement was seen as "rigged", "non-transparent" and "disenchanting" (p.130). The essential difference between IT duopoly and federal arrangement is here

that in IT duopoly, only either local business representation or corporate representation, but not both (p.62). Because Aalto IT was an IT monarchy to some degree, there was representation from local IT managers and central IT executives and managers (central being equivalent to "corporate"). However, due to the federal nature, we can gain some insight from these results of federal and IT duopolies. All in all, the researchers noted that the federal model is the recommended option for input in all five key IT decisions (p.129). What this tells us is that collecting input from both central and local for decision-making is generally the best alternative.

With decision-making (table 2), IT duopoly was the best performing archetype, while federal was the worst. In IT duopoly, the decisions are made by an IT group attempting to reach consensus with either the business units or the corporate center, but not both. This arrangement leads to "creative business solutions within agreed-upon constraints, but remains focused on the particular business issues at hand" (p 132). The focus is more strategic and performance is superior, if there is no need to "balance the interests of the center and all the business units" (p. 132). Weill & Ross (2004:65) also note that IT leaders' participation in the decision process "establishes realistic expectations for IT and forces clarification of business strategy". What I don't find surprising is the observation that when business unit leaders make decisions about IT infrastructure or IT architecture, the results are poor. Having federal structure instead of IT duopoly shifts the decision-making power from IT managers and executives from the business managers and executives, and the results are not surprising, as IT architecture and infrastructure strategies are – after all – a topic that requires knowledge on information technology. Some enterprises in Weill & Ross study (2004:130) set enterprise-wide gains as objectives to the business in order to cope with the issue of unaligned goals in federal structures. Enterprises also often use executive committees and management teams to avoid and solve conflicts arising from the federal model (Weill & Ross 2004:61), as the departments and the center may have different, conflicting interests.

	IT Decisions				
Decisions in archetypes	**IT Principles**	**IT Architecture**	**IT Infrastructure Strategies**	**Business Application Needs**	**IT Investment**
Business Monarchy					
IT Monarchy					
Feudal				top	
Federal	poor	poor	poor		poor
Duopoly	top				top
Anarchy					

Table 2: Performance of archetypes for decision-making in IT (Weill & Ross 2004:131)

3.3.4 Decision-making and steering groups at Aalto

Steering groups and committees were also used in the structure of Aalto University (figure 1). Referred to as *ICT-groups*, they were responsible for handling the overview of the respective school's IT related matters. The ICT group consisted of IT workers and other personnel from the departments, such as researchers. As representatives of the central Aalto IT, it had an account manager and a customer service supervisor. The ICT group and its periodic meetings were the primary structural channel for sharing IT-related information and conveying suggestions and requests between the departments and Aalto IT. The members from the school side could e.g. convey complaints of the functionality of IT systems to Aalto IT, or they could use the meetings to discover common needs between the departments and request for Aalto IT to initiate projects.

As mentioned before, finding cost-savings, avoiding redundancies and selecting the most strategic projects was the prominent modus operandi at Aalto. Because of this, the ICT-groups and the steering groups were (at least temporarily) officially not given the authority to make investment decisions by themselves, but only were for information sharing and making suggestions. The suggestions were forwarded to the IT-portfolio steering group, residing above the other steering groups; this consisted of relatively high-level managers from all around the university. The IT-portfolio steering group made the approvals for projects, and with an approval, Aalto IT could utilize its budget and resources for the projects and tasks. This arrangement was made since the university was in "money saving mode", and needed a very strict control of the IT investments, and to select only the most important projects for implementation.

Apart from the ICT-groups, three other steering groups were part of the IT duopoly: steering group for IT in education and communication, group for IT services, and a group for IT infrastructure. Similarly, these groups consisted of account managers and various individuals from different units in Aalto, and they were a route for Aalto University units to express their opinions and requests on the IT related to education or infrastructure or the IT support. They consisted mostly of members outside from other units that were not part of the schools, such as human resources or finances, and thus they were in a sense a structural link between Aalto IT and the units which did not have ICT-groups.

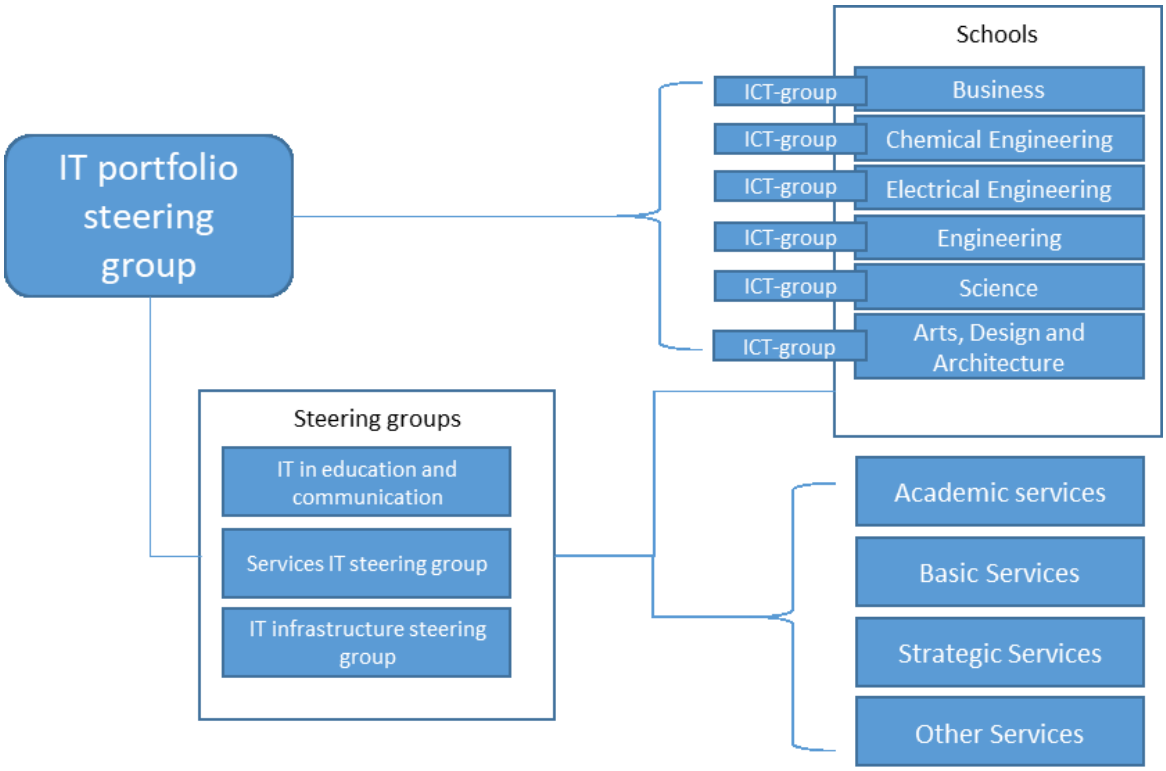

Figure 1: IT steering groups at Aalto University

3.3.5 Locus of decision-making and the speed of project implementation

These IT governance research results of Weill & Ross (2004) are something to take into account when structuring an IT function. They can be reflected with IT governance of Aalto, although somewhat indirectly. In general, the federal model brings complications

to decision-making (p. 61) since the central leaders and the unit leaders try to reach a compromise, while they tend to have different objectives and responsibilities. Weill & ross point out how one reason for this is that business units' leaders often have incentives that disregard the organization-wide benefits over the benefits of the business unit. Decision-making was seen as generally slower, as more personnel with different interests is involved, decisions pass more stages, and significantly many compromises are made at the cost of effectiveness. Simson (1990) and Frey (2014:109) also noted how decision-making was prone to be slower and more cumbersome with smaller projects when compared to localized decision-making. Meanwhile, the decentralized IT units were credited for being flexible and quick to approve projects: "The interviewees attributed a high degree of flexibility and relatively fast approval processes for local projects to decentralized IT project portfolio selection arrangements. Thereby, the local units were enabled to respond quickly to their business needs" (Frey 2014:109). Centralized IT necessitated more documentation, translating to more bureaucracy (p. 111). With small IT-related issues in business units, however, it takes more time, if they have to pass through centralized unit, rather than the business unit having an IT function responding to them directly. (p. 109). Meanwhile, business and IT had a closer relationship when IT was located near business units (p. 116). The interviewees in these studies pointed out that quick decision-making and project implementation that the decentralized IT provided had a particular value in the competitiveness of the business units (p. 145). Business units in general favored decentralized IT arrangements as the requirements for IT implementations could be discussed directly with the IT personnel (p.116). Frey and Buxmann (2011) also observed that with smaller projects, especially when lateral cooperation was not necessary, project initiation was faster in decentralized arrangements compared to centralized.

The observations in Aalto also corroborate this literature. A disadvantage in the federal structure often mentioned by the interviewees was the slowness of decision-making. It was mentioned that the federal model works well, but it's missing "a fast lane". People always needed to wait for the next meeting of the appropriate portfolio group in order to advance an issue further. The steering groups met on predetermined intervals to process the topics, and it could often take several months to get the necessary decisions for a seemingly small project. In some cases, it could take two years to get from initial request into project completion. Some departments compensated this by building tempo-

rary solutions for their business units' needs while waiting for the heavier Aalto IT solution to complete.

The centralized setting also carried the problem of heavy bureaucracy with it. The department personnel who wished to initiate IT projects with Aalto IT were required to fill a multitude of forms, to the point where the process was described as inhibitively cumbersome. The forms required work estimates, and according to complaints, they were considered difficult to provide, consumed a lot of time, and often filled incorrectly to significant extent. The customers needed to fill the forms well ahead of the steering group meetings, but were nevertheless generally ultimately handed at evening, the day before the meeting. In general, Aalto IT attempted to plan the project portfolio six months ahead, but the customers in the departments often hardly knew that far in advance what they were going to need. In essence, heavy bureaucracy equates to slower decision-making discussed in previous paragraph, equating to more work and therefore more cost.

When examining this issue of speed in decision-making in information systems development, we can make a delineation that it can be deconstructed as a juxtaposition between *information systems development* and *optimization of information systems development*. Ultimately, the reason why decisions generally spend time passing through committees, relationship managers, and different teams is that the organization is trying to find the cost-savings, synergies and similar benefits mentioned in chapter 3. Instead of simply getting started with working on, for instance, a service or software that the local business needs, the central IT will try to find out if there are other departments that need similar IS development. There might be a possibility that by modifying the requirements of a needed system, the departments or central IT can join forces and develop it for the needs of larger section of the organization, and thus avoid developing similar systems around the organization in vain. The work required to find these opportunities will take time, however, and this would therefore become a choice between finding cost savings – and quite possibly long-term benefits – or gaining speed in execution.

Now, when business operations are strategic, the speed of execution can be of high importance, while keeping the costs down might be more important aspect for non-strategic operations. On the other hand, as we elaborated in chapter 3, the more generic

the IT is, the easier it is to find opportunities for cost-savings and synergies and maintain compatibilities. Therefore, if an enterprise employs the premise that speed is important for strategic operations – or strategic operations are *time-sensitive* – and cost-savings are important otherwise, we can use these observations to conceive a parameter for the operation of IT function in such case: *the uniformity of IT and the strategic importance of business affect the quantity of optimal amount of optimization in information systems development.* For example, if an organization is executing a project to create a (generic) IT infrastructure for (non-strategic) supportive business units, and the organization is not significantly impacted by slowness of IS development in these units (*not time-sensitive*), the amount of *optimization* in the IS development should be high. Time should be taken to find cost-effective solutions that maintain compatibility long into the future. Conversely, if quick action is needed for IS requirements in a strategic business unit, then it would be recommended to *avoid centralizing* the decision-making process.

Finally, a small noteworthy matter for regarding this topic is also the phenomena that can occur when decision-making is being too slow. An interviewee mentioned the concept of *shadow IT,* or "technology introduced into an organization that has not passed through the IT department" (cxounplugged.com, 2013). If business units have a need for some specific information technology, and the decision-making or project implementation is acting too slowly toon this, the situation might manifest as the increase in aberrant IT equipment appearing in the organization, as personnel will simply acquire the needed IT on their own. Also, one interviewee reported how, in some historical instances, department managers had a need for IT personnel, but the IT governance was strict about having centralized IT personnel only. This was considered too inconvenient for the business units, and the departments resorted in hiring IT employees, but would simply "hide" them by giving them non-IT titles. These types of symptoms appearing might be an indication of IT decision-making or IT operations being too rigidly centralized.

4 Secondary IT function elements

4.1 Overview

So far, this thesis has discussed two elements in the structuring of IT function: how should the activities of the IT function be distributed within the organization, what type of decision-making alternatives are available, and what are the benefits and disadvantages of different arrangements. Specifically, this thesis has been studying the distribution of operations and decisions-making in the context of a classic, somewhat large enterprise with several departments large enough to potentially have internal IT personnel – this presumption will remain. Next, I will examine other elements that are typically form part of the structure of IT function in this type of organization.

These elements are:

- IT function connections: If the IT function is splintered within the organization as individual departments, teams or even individual people, a question arises as to how to connect these units together in an optimal way. After all, these units need to be aware of actions of one another in order to operate as a one IT function; this awareness is facilitated by what I refer to with “connections”.
- IT team sizes: Simply put, what are the differences between large teams, small teams and individual people, when responsible for the IT activities – besides the cost.
- IT managerial skill: What kind of effects can the competence of an IT manager have on a decentralized IT unit.
- IT personnel proximity to business: Finally, I will make some notes about how the physical location of the IT personnel is also a factor that has impact on the effectiveness of the IT operations.

I refer these elements secondary or auxiliary in nature. The reasoning for this is that in my view, the primary elements presented in chapter 3 have more substantial effect on the IT function structure. When forming the IT function structure, I recommend assessing how to arrange the primary elements as type of pillars to build the IT function on, and only after this considering the effects of the secondary elements. What should really be considered first and subsequently, would more likely depend on the circum-

stances of the enterprise in question; this thesis will provide this classification as the default arrangement, however.

4.2 Connections in the IT function

4.2.1 Overview

As mentioned in the overview of chapter 4, this thesis examines the IT function in the context of a traditional organizational setting with a central unit (i.e. corporate center) and business units or departments. In this type of organization, the influence of the IT function is spread out in some manner, and as discussed in chapter 3.2, generally the personnel working for the IT function is spread out as IT teams or IT workers within the organization as well. In order to work as a one function, all the parts of the IT need to be connected with each other. Some type of connections manage to mitigate some of the problems presented earlier, and some connections help the IT function to find opportunities to add value to the IT operations.

In 1980, Olsen & Chervany (p. 59) mentioned two compromising mechanisms for maintaining good level of service to business units while employing a centralized team. One is to dedicate central team members to focus on a specific business unit, so that they may attain unit-specific knowledge and thus give the unit better service. Another one is to use liaison roles to function as a link and maintain the communication between the central team and business unit. Especially, if an organization is particularly decentralized, its beneficial to have liaisons "facilitate communications with users to promote user involvement in project development." (p.66). Frey (2014:214) also observed from case studies that liaisons, or relationship managers are essential for discovering and informing the management of interdependencies, redundancies, synergy potentials and potential conflicts in federal arrangements. Committees consisting of business unit representatives could often leverage this benefit well (p. 215). In particular, a liaison can act as an access point for business units to reach the IT function; having relationship manager is essentially a starting point, if someone wishes to inquire IT function matters, but does not know whom to contact directly. While discussing the importance of efficient demand management, Frey & Buxmann (2011) noted in their studies how business units considered it in high regard to have a single, defined interface to the IT function, and it was observed as necessary to avoid inconsistencies and redundancies. In summary, having a dedicated relationship manager to whom the business unit personnel can

simply direct IT related issues is very effective for good coordination between the centralized IT and the units.

4.2.2 Bicycle wheel and relationship managers in Aalto University

The benefit of relationship managers was also apparent in the case of Aalto. It provided simplicity for the personnel in the departments to have a single point of contact – an *account manager* and a *customer service supervisor* (CSS) – in case of issues, requests and questions. The present IT governance model for Aalto University represents the bicycle wheel-structure, described by Weill & Ross (2004:62). The bicycle wheel refers to an arrangement where the central IT is connected to business units by *relationship managers*. For this role, Aalto IT employed several account managers and customer service supervisors, where each account manager and CSS were intermediators for specific schools. An account manager was a supervisor to the CSS and took a broader perspective on the enhancing the cooperation between the center and the units, while the CSS was more oriented towards support for common questions for department personnel of the arrangements with Aalto IT and the department. This was also common structure in studies by Frey 2014 (p 103).

The account manager and CSS of each school participated in meetings of the school's ICT-group. Restating the description from chapter 3.3: The ICT-group was responsible for handling the overview of the school's departments' IT related matters. Apart from the account manager and the CSS, an ICT group consisted of IT workers and other personnel from the departments, such as researchers. The ICT group and its periodic meetings were the primary structural channel for sharing IT-related information and conveying suggestions and requests between the departments and Aalto IT. The members from the school side could e.g. convey complaints of the functionality of IT systems to Aalto IT, or they could use the meetings to discover common needs between the departments and request for Aalto IT to initiate projects.

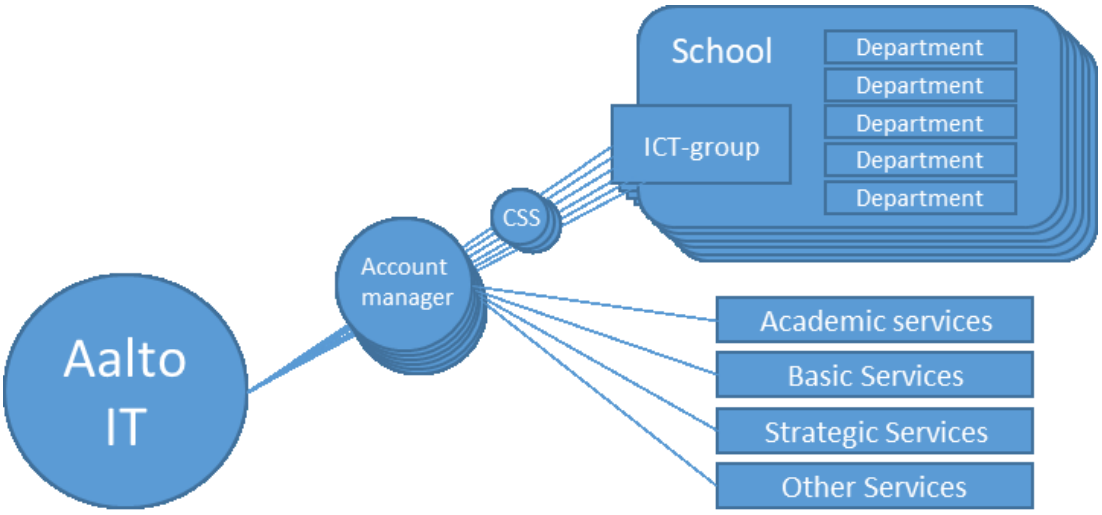

Figure 2: Account managers and customer service supervisors connecting central and department IT

4.2.3 Connections and work fluctuation

One issue, presented in an interview, were the challenges in managing an IT teams in departments when the amount of available work was fluctuating substantially. One business unit might be understaffed with IT personnel during a laborious project, while another unit has too little ongoing work. Personnel that does not have any tasks at hand, may invent non-value-adding tasks for itself in order to keep busy, as was suspected to be the case in one department. In an organization that uses mainly own employees for IT related activities (as opposed to outsourcing), the time the IT personnel uses is often one of the most significant sources costs. In Aalto, the staff costs consisted of 45% of overall IT costs, while the hardware counted for 18%, the facilities for 11%, and the software for 7% (Bencheit, 2014). In this case, a significant measure of how cost-effective the IT operations is correlates well with how much value does the IT personnel provide per hour they spend. In the worst case, the IT workers are idle as there are no value-adding tasks available for them, and a significant share of the IT costs are used for simply nothing. In another case, the IT workers might be working on something that will not be beneficial for business in any way, and the IT costs are targeted for redundant operations. This could, for instance, refer to development of software that will not be needed by business units or will be replaced by another software, either developed or acquired elsewhere in the organization. Although the work might be redundant, the workers might get more experience from the work, which may or may not be applicable later on.

One rather independent Aalto university department had two methods for countering the fluctuation in amount of work available for the IT personnel. The first came with the use of the Kanban methodology. In their Kanban setup, the projects were ordered according to their designated priority, and the employees would work on the projects based on the priority, whenever they had the time available. Occasionally, there was a burst of general IT support requests for the IT workers, and the workers would set the projects aside to handle the support activities, and then would resume with projects after this. There were always projects in queue, and the ones with the smallest priority could remain at the end of the queue for years. In this way, according to the interviews, there was no slack for the workers in-between projects. Another method the department used for avoiding idle work time was that the IT workers had multiple roles. If there was no IT-related work available, the IT personnel would continue with their other activities. For instance, some of the employees were part-time IT workers and part-time researchers, and would switch between the jobs as needed.

However, decentralization can cause cost-inefficiencies if the management of the decentralized team is not skilled enough to make sufficient work allocation arrangements. Naturally, a centralized team would have the same issue, and the centralized personnel might simply invent non-valuable things to do. However, as they would be responsible for the IT of the entire enterprise, they presumably would be more occupied by the work of all the units than a team of an individual unit.

The cross-departmental coordination of assignments can allow the personnel to flow between projects from unit to the center and even to other units. One observation that occurred during the study was that using mechanisms that group individuals from various parts in an organization has the latent benefit that it introduces the group members and their roles to each other. Cross-unit relations and cooperation emerging might eventually depend entirely whether the correct individuals in different units are aware of each other, and by proxy, the possibilities that the cooperation would allow. Also, it promotes sharing knowledge of employees' skills across the organization. This would indicate that even temporary groupings with personnel between business units could have a significant positive effect in cross-unit collaboration.

We can use this insight to draw some conclusions for creating suitable connections for the IT function:

- If the need for IS development is infrequent and voluminous, having strong connections for a decentralized team is important to ensure a way to mitigate the work fluctuation
    - The alternative would be to have specific centralized IT personnel assigned to service the business unit
- If the need for IS development is continuous, voluminous and unique to the business, having a local team would most likely be beneficial as their contribution is needed in significant quantities, and the personnel need the business-specific knowledge
    - If needs are not continuous, but yet unique, a decentralized team with business-specific knowledge and with strong connections might be the best alternative

4.3 Team sizes

4.3.1 Overview

When establishing teams of IT personnel around the organization, the sizes of the teams is a subject worth considering, as the size has an effect on how the team works in various circumstances. The departments of Aalto needed a relatively wide range of quantities in IT services, and this reflected on the amount of IT personnel that ended up working in them. This gave some insight into how the dynamics of different team sizes worked with the IT function.

4.3.2 Single-person IT service and a team

A discernible point of interest in Aalto was the upkeep and development of IT infrastructure in cases where only one or two persons were handling the general IT activities in a business unit and when compared to a group of employees handling the IT activities for multiple units. Before Aalto started centralizing the IT infrastructure operations across the business units, many department maintained their own IT infrastructures with one or two IT-administrators. Their work consisted mainly of tasks such as maintenance of the local area network, file storage systems, database management systems, servers, and maintain and acquiring common applications and licenses, such as e-mail software

or Microsoft Office products, and also administering user rights. The sole IT administrator was responsible of “little bit of everything IT” in the department, and this variety of duties may make the arrangement somewhat suboptimal.

First, an IT administrator with a wide range of responsibilities gains some amount of expertise in many topics, but the experience becomes spread relatively thin over many areas. If multiple departments have a joint IT team consisting of multiple IT workers, however, these team members can individually specialize in different topics, and serve the all departments accordingly with superior knowledge on it. One person can gain extensive amount of expertise on, for instance, database management, router configurations or server maintenance, and provide related services with better efficiency. According to the interviews, if a server computer stopped functioning, an individual IT-maintenance person responsible for the IT infrastructure occasionally had to spend a relatively long period of time attempting to overcome the situation. A team more likely had a person who was responsible for specifically responding to these kinds of issues, and thus was able to solve it more quickly due to the experience. In this way the size of the team affects the quality of the IT infrastructure maintenance and support work the team provides.

4.3.3 IT infrastructure resource pooling

Increased quality of the IT infrastructure can increase the value of business applications, if the performance of these applications is dependent on the performance of the hardware and network (Cho & Shaw 2009). The speed of recovering malfunctioning IT infrastructure services has particular importance since the delay often affects the business operations and the organization in general. If a server computer that an entire department or a project team requires – in order to continue their work properly – was shut down, the business activities could become stalled for the time it takes to restore the functionality. What makes this more significant is that as the IT services and technologies improve over the course of time, organizations become gradually more and more dependent on IT in operations. Thus, maintaining the specialized skills that enable speedy recovery of systems becomes progressively more valuable.

Another factor affecting reliability of IT maintenance stems from absenteeism. In Aalto, the interviewees pointed out that maintaining the upkeep of IT infrastructure suffers from absence of personnel in small teams. Absenteeism can occur not only due to sick

leaves, layoffs and retirements but also due to vacations, and thus occurs on a regular and expected basis. When a sole IT worker in a department goes absent, some operations that depend on the worker in that department may simply halt. In a team, of one employee is absent, the others may be able to substitute, and the overall work performance for departments does not drop as significantly.

Adding to the mix, Frey (2014:118) observed that congregating the IT personnel into a group creates benefits from having a *pooled* work force, and how that alleviates the issues from small teams. Specifically, Frey noted that it

- gives flexibility in assigning personnel for projects,
- gives scalability to resource management, especially during mergers and acquisitions,
- makes it easier to substitute resources

Utilizing these observations, we can make the conclusion that having solid IT employee pool is particularly vital for business that is strategic and sensitive to IT infrastructure problems. If business operations have strategic value from IT support and infrastructure, the IT team either the team needs to be large enough, or well connected to an employee pool of another large team e.g. a centralized IT team.

4.3.4 Larger IT groups attract better managers

A conjecture regarding the connection between managerial skill and team sizes occurred during the study: Having a team of employees gives opportunity for establishing a position of a team leader. This managerial position attracts personnel with qualities for leadership, and qualities for good leader would include these value-adding capabilities. In other words, I articulate that individual IT administrators may generally be suited for IT maintenance in a supportive role, whereas a team of IT workers may more likely have a team leader who is more *driven* for making progress proactively, and more capable of determining what type of IT infrastructure work adds true value to the organization. In summary, this would imply that congregating dispersed IT workers into a larger team would help transforming the IT infrastructure development to add more value and be more proactive and strategic in nature. This was observed in practice as some seemingly highly capable IT managers with career aspirations were advancing the IT infrastructure

development with relative effectiveness in multiple departments with a team, while individual IT employees in other departments acted mainly as IT administrators and help desk personnel. The topic of managerial skill itself deserves its own chapter, however.

4.4 IT managerial skill

4.4.1 Effect of manager skill in the IT function

Comparing the arrangement of individual IT administrators to the centralized teams, a recurring, interesting aspect was whether the work was reactive or proactive. Generally speaking, IT personnel mostly managed issues as they come: if more disk capacity or computation speed is needed, more will be acquired; if a server goes down, the functionality will be restored. Apart from reacting to the issues and needs as they emerge, the IT function can, of course, proactively develop the IT infrastructure for anticipated problems and needs. In this manner, the role IT function can transform from passive supporter towards a more strategic role that actively attempts to enhance business operations. The study pointed out reasons why having a more centralized team as opposed to individual, dispersed IT workers may advance this transformation.

The interviewees in some departments pointed out a specific need for enhancement with IT infrastructure: the recovery of lost data was not at sufficient level, as the backing up of files was generally done rather haphazardly. People saved copies of their files on various places around the network file system or on external hard drives on occasional basis. A solution was required for the employees to get backups of their work on a regular basis in order to prevent valuable research work and data from disappearing, and preferably in a way where the backing up of files puts minimal amount of disruption to work. This functionality was not a necessity in the sense that it was not required in order for business to operate normally, but rather a feature for diminishing risks. According to the interviews, individual IT administrators had difficulties in implementing this back-up-system, while a more centralized group of IT personnel turned out to be more suited for arranging it. One reason for this was that this type of a project was simply too large for the individual IT workers to handle. Another reason may have been in the difference in traits between IT-employees. According my subjective character assessment as the interviewer, some of the IT workers were better than others, when it came to discovering important tasks and advancing these tasks within the organization. Specifically, some people had superior capabilities in

a) finding good solutions to complex problems,
b) distinguishing valuable activities from non-value adding activities, and
c) have more initiativeness for driving the value-adding activity forward.

These are qualities that are important for the capability to discover approaches to make value-adding improvements to the existing situation proactively, without having an urgent pressure to cater for the immediate business needs, and what proactive IT infrastructure development requires.

The case study gave rise to the observation that the skill of management can be more significant factor in efficiency than structure of the IT function. Some of the observed departments were managed by people with (arguably) a significant difference in management skills. The theoretical benefit of decentralized structures is, that the service to the local business unit is superior at the tradeoff of a worse cost-efficiency. However, as elaborated previously, some managers were more able to negate the disadvantages while taking advantage of the decentralization more effectively: IT managers were able to reduce idle work time issues in their decentralized departments using Kanban workflows and assigning multiple roles, while still finding opportunities for synergies across projects. Meanwhile, some department IT managers were mostly simply reacting to support requests as they appeared. If there was no work available, the IT employees would simply work on seemingly random projects, and the value of the work was not clear. The ability to find and exploit synergies depends partially on the IT personnel's ability to communicate with project personnel and the ability to further advance the process with e.g. project management skills. If the department did not have particularly skilled managers, the department might not get extensive IT services no matter what kind of structure. Avoiding redundancies requires management skill.

4.5 Proximity of IT personnel to business

4.5.1 Overview

The last IT function element that I will give a brief look is the effect of proximity of the IT personnel to the business operations. It was observed by e.g. Kahai et al (2002:49) how, as IT personnel is located closer to the end users, they understand better what the end users do, and thus are better able to assists with their issues. Being physically located near the end users increased the efficiency in giving support. These observations

were also heavily emphasized by some of the Aalto interviewees. The cooperation between the researchers and a local IT group in close proximity worked out quite smoothly: If the researchers had IT-related needs, they could simply “knock on the door” and talk about it with the IT team. Having a local presence lowers the barrier for communication between the IT, thus enhancing the business-specific knowledge of the IT team. Also, according to the interviews, the IT personnel would hear about the projects ongoing in the department on random occasions, such as during coffee breaks, finding opportunities for improvements or cost-savings. In this manner, again, the local presence improves the local knowledge of the IT due to the communication via random social occurrences.

An interviewee mentioned how using a IT service ticket for support request is convenient for simple issues, such as getting a new workstation or resetting a password. In more complicated cases, the IT worker would need to be familiar with the customers situation related arrangements in order to assist properly. In Aalto, the centralized IT and the local IT worked together with a system, where a person working in the department in need of IT support would send a ticket to the ITSM (IT service management) system handled by the centralized IT. The centralized IT would then escalate it back to the department, if they could not handle it themselves. The IT support staff in the department seemed to be very satisfied with the arrangement, as it would take a load of routine work from them, and allow them to use their time on more complicated issues. Significance of this was underlined by another interviewee pointing out how biggest share of IT maintenance time was taken by requests to assign user rights to personnel.

The observation here is that the physical proximity is a factor in the IT function, that enhances the benefits of local IT group mentioned so far in this thesis. This is also an example of how utilizing processes (e.g. ITIL) and information systems (ITSM) the IT function can gain the benefits of the local proximity, while still gaining value from a remote centralized IT.

5 Conclusions

5.1 Overview

The objective in this thesis gain and expand the understanding the ingredients of the IT function. The subject of study, Aalto University, was in the process of discovering the best way to formulate the way to govern and operate its information technology and the personnel working with it. Using interviews and discussions, I have attained and recorded many ideas and insights by the faculty, and reflected this information against the prevalent literature. This provided me with a number of conclusions, that will hopefully be of use for the readers in understanding the structuring the IT function.

I have divided my observations from the case study into five categories, or elements of the IT function. Two primary elements for the IT function are

1) locus of operations and
2) locus of decision-making.

Three secondary elements in the IT function are

3) connections,
4) team sizes, and
5) proximity.

When analyzing these elements, I aim to take into account their characteristics in the IT function as presented in the literature, and see if my own observations align with them. I noted any discrepancies or additional characteristics that I could discover, and attempted to clarify the rationale behind them. In particular, I utilized the thinking and observations of the interviewees on whether these characteristics were accurate. As a result, I was able to produce simplifications and parameters that should give new means for developing the IT function.

5.2 IT function elements

5.2.1 Locus of operations

With locus of operations, I've presented the common viewpoint in literature, that having a centralized IT unit provides benefits such as elimination of redundancies, finding syn-

ergies and economies of scale and improved compatibilities, while decentralized team brings superior, more knowledgeable and faster service. My observations concur with this literature, but with some caveats: if business requires information systems that are particularly unique in nature, it might be necessary to have a local team with good understanding of the business itself, in order to find these opportunities for synergies and removing redundancies. In general, the characteristic parameter is here that the requirement for local IT specialists quite possibly depends on how generic or unique the IT is.

The literature also, in general, stated that centralized IT is better for large and strategic projects. My argument with this statement was that the case study indeed backs up the claim – finding financing or resources for larger projects is more convenient for a centralized team. A centralized team that is connected to the department IT teams can specialize in the capability of managing cross-departmental projects. However, I found it questionable to say that centralized IT is better at finding strategic projects. This might indeed be the case with enterprises with centralized strategy, i.e. strategy that comes from the top and guides the subsequent strategies of the business units. If the business units, however, have autonomy in their strategies, then centralized IT can be relatively disconnected from the strategic IT.

5.2.2 Locus of decision-making

When examining the concept of decision-making in IT function, I learned from the literature that having federal characteristics in decision-making will make it good for collecting input, but slow to execute. In a federal model, business units and enterprise center attempt to reach a consensus, and this can lead to conflicts since unit managers and central executives can pursuit after misaligned incentives. Also, decision-making will be slower as the information and decisions pass through more people, and people need to spend more time bureaucracy i.e. filling forms and the like.

The case study does align with the literature. It did however, help me simplify and the parametrize information systems development optimization: when federal structures spend more time handling decisions regarding information systems development, they are optimizing IS development, which is an attempt to gain cost-savings at the cost of optimization time. Now, the importance of cost versus optimization time can be juxtaposed with strategic importance of operations and uniformity of IT. If information system needs to be done quickly in order to gain strategic business advantage, commit less

time for the federal decision-making processes, and act faster locally. Also, more opportunities for finding targets for optimization present themselves when the IT is more similar in nature. It is likely unwise to try to optimize development with unique and strategic business applications.

5.2.3 Connections

Centralized and decentralized teams need to be connected with each other in some manner, unless the goal is to have a rudderless IT anarchy or a siloed feudal organization. As illustrated both by literature and case study, connections can be quite succinctly arranged with a) steering groups and committees, where people from different departments and the center, can attend to and share information and make decisions together, and b) relationship managers, who can act as interfaces and connecting liaisons between two departments, or departments and the center.

Having connections between organizational units facilitates sharing knowledge of skills among employees, enables reallocating work-hours from one unit to another in case of work overload or lack of work, and it allows units to find opportunities to cooperate on projects, and finding synergies or opportunities to eliminate redundancies.

The parametrization that follows, is: voluminous and fluctuating amount of work in a department necessitates strong connections to avoid empty work time or resource shortages.

5.2.4 Team sizes, managerial skill and proximity

Having larger teams allows employee pool, which allows skill specialization and alleviates the threats that can come from absenteeism or IT infrastructure malfunctions. Therefore, strategic business units that depend on IT reliability would benefit either from a sizeable IT team, or a strong connection to one.

Larger teams also attract better managers, according to literature. Managerial skill is, again, quite significant factor, since many of the benefits that can be gained from IT function mechanisms, such as finding redundancies or synergies creating strategically enabling IS systems, can depend heavily on the competence of the responsible IT managers.

Finally, I note the observation that having IT people physically close to the customers in the business unit promotes many of the benefits that a local team generally has. An IT employee can learn a lot in the break room.

5.3 Suggestions for further research

5.3.1 Further examination of IT function elements, organizational elements, and their relationships

I feel as the approach I am using for gaining understanding about how to structure the IT function should be utilized more. More elements of the IT function should be discovered, and more parameters need to be extracted. And especially, the relationships between all the organizational elements and IT function elements should be examined more closely. I believe, that by discovering, connecting and evaluating more factors that affect the performance of an IT function in an organization, a framework could be created that allow finding the optimal adjustments to would make it a straightforward endeavor make a typical IT function considerably more effective and cost-efficient.

References

BencHEIT, Benchmarking (2013). Survey on distribution of costs in European higher education costs. http://www.eunis.org/task-forces/benchmarking/

Brown, C. V. and Magill, S. L. (1994). Alignment of the IS functions with the enterprise: Toward a model of antecedents. MIS Quarterly, 18(4), 371 – 403.

Brown, C. V. and Magill, S. L. (1998). Reconceptualizing the context-design issue for the information systems function. Organization Science, 9(2), 176–194.

Cho, Wooje and Shaw, Michael J., (2009). "Does IT Synergy Matter in IT Portfolio Selection?". ICIS 2009 Proceedings. Paper 160.

CXOUnplugged, The Rise of Shadow IT – Should CIOs Take Umbrage? Visited 27.11.2017, http://cxounplugged.com/2013/04/shadow_it/

Frey, Thorsten and Buxmann, Peter, (2011), "THE IMPORTANCE OF GOVERNANCE STRUCTURES IN IT PROJECT PORTFOLIO MANAGEMENT". ECIS 2011 Proceedings. Paper 17.

Frey, Thorsten (2014), Governance Arrangements for IT Project Portfolio Management – Qualitative Insights and a Quantitative Modeling Approach, SpringerGabler, ISBN 978-3-658-05660-5

Kahai, P. S., Snyder, C. A., and Carr, H. H. (2002). Decentralizing the IS function: Resources and locus of decisions. Journal of Computer Information Systems, 42(2), 44–50.

Olson, M. H., and Chervany, N. L. (1980). The relation between organizational characteristics and the structure of the information services function. MIS Quarterly, 4(2), 57–68.

Simson, E. M. (1990). The “centrally decentralized” IS organization. Harvard Business Review, 68(4), 158–162.

Venkatraman, N. and Henderson, J., C. (1993) Strategic alignment: Leveraging information technology for transforming organizations, IBM Systems journal, vol32, no 1, 1993.

Weill, Peter and Ross, J. W. (2004). IT Governance - How top performers manage IT decision rights for superior results. Boston: Harvard Business School Press.

Weill, Peter (2004). Don’t Just Lead, Govern: How Top-Performing Firms Govern IT, MIS Quarterly Executive Vol. 8, No. 1/March 2004.

Zmud, R. W., Boynton, A. C., and Jacobs, G. C. (1986). The information economy: A new perspective for effective information systems management. DATA BASE, 18(1), 17–23.